

Table G-1
ST012 Spill Log

| Date of Spill | Location | Cause/Source | Material Spilled | Volume Released (gallons) | Volume Recovered (gallons) | Sample Date | Analysis | Detected Analyte | Concentration (mg/kg) | | SRL (mg/kg) | Mass Estimate ² (mg) | Reportable Quantity (kg) |
|---------------------|---|---|---------------------|---------------------------|----------------------------|-------------|--------------|-----------------------------|-----------------------|-----|-------------------|---------------------------------|--------------------------|
| 9/25/2014 | T-102 | 2-inch fire hose left running with domestic water. | Domestic water | | Allowed to evaporate | | | | | | | | |
| 10/21/14 – 10/24/14 | Blowdown line along Manifold Line | Leak on blowdown line from steam boiler (only one operating at the time of incident). An estimated 20 gallons per day were released and all blowdown water was contained onsite. | Blowdown water | | Allowed to evaporate | | | | | | | | |
| 10/22/14 – 10/23/14 | Cooling Tower Area | Potable water spill due to an error in the cooling tower pump float setting . | Potable water | | Allowed to evaporate | | | | | | | | |
| 11/9/2014 | Boiler/DA Sump Blowdown | Spill of 300 – 400 gallons of city water treated with boiler chemicals due to potential sediment issue with sump pump. Water was non-impacted/site water. | Blowdown Water | 300-400 | 50 | | | | | | | | |
| 11/13/2014 | Boiler and Deaerator tank sump | Sump pump malfunction caused blowdown water leak of approximately 300 – 400 gallons | | | | | | | | | | | |
| 11/22/2014 | Boiler 2 Deaerator tank | Boiler 2 lost power and the fill valve to the de-aerator tank was left open, causing the de-aerator tank to overfill | | | | | | | | | | | |
| 11/23/2014 | PVC domestic water line to the water softener conex | Spill of 200 – 250 gallons of domestic water due to a leak in the PVC line. | | | | | | | | | | | |
| 12/5/2014 | LGAC vessels | Bleed line cracked and 20 – 30 gallons of water sprayed from crack and onto concrete pad. An estimated 10 – 15 gallons ran off pad onto ground. Water had previously gone through the air stripper the carbon vessel. | Process water | 20-30 | 0 | 12/5/2014 | 8260b, 8270c | 1,2,4-Trimethylbenzene | 0.044 | J | 52 | 24.3 - 36.4 | NA |
| | | | | | | | | methyl cyclohexane | 0.083 | J | 230 | 45.8 - 68.7 | NA |
| 12/13/2014 | LGAC vessels | The site containment alarm near T-104 was activated due to a gasket leak at the top fill port of C-102. Approximately 200 gallons of air stripper treated water flowed out from around the gasket and traveled across to the containment sump (with most of the water pooling in the depression under T-104). | Process water | 200 | 100-150 | 12/15/2014 | 8260b, 8270c | Benzo[a]pyrene | 0.034 | J | 0.69 ¹ | 188 | 0.454 |
| | | | | | | | | Benzo[b]fluoranthene | 0.06 | J | 0.69 ¹ | 331 | 0.45 |
| | | | | | | | | Benzo[g,h]perylene | 0.031 | J,M | NA | 171 | 2270 |
| | | | | | | | | Chrysene | 0.043 | J | 2,000 | 237 | 45.4 |
| | | | | | | | | Fluoranthene | 0.047 | J | 22,000 | 259 | 45.4 |
| | | | | | | | | Pyrene | 0.042 | J | 2,300 | 232 | 2270 |
| 12/30/2014 | LGAC vessels | During the pump down of the second vessel (top port open to allow for pump out), the boiler blew down and the line back flowed into the liquid carbon vessel and overflowed the vessel fill port (the blowdown line normally discharges to the liquid carbon discharge line). Cause was failure to close all valves to isolate the vessels prior to pump out activities. Approximately 30 gallons were spilled, 15 of which flowed off the pad. | Blowdown Water | 30 | 15 | 12/30/2014 | 8260b, 8270c | Cyclohexane | 0.25 | J | 140 | 207 | 0.454 |
| | | | | | | | | methyl cyclohexane | 0.73 | | 230 | 604 | NA |
| | | | | | | | | n-hexane | 0.15 | J | 110 | 124 | 2270 |
| | | | | | | | | Bis(2-ethylhexyl) phthalate | 0.056 | J | 1,200 | 46.4 | 45.4 |
| | | | | | | | | Pyrene | 0.017 | J | 2,300 | 14.1 | 2270 |
| | | | | | | | | | | | | | |
| 1/6/2015 | LGAC Vessel Backwash Pump | Transfer hose separated from pump | LGAC Backwash Water | 100-150 | 100 - 150 | 1/7/2015 | 8260b, 8270c | 1,2,4-Trimethylbenzene | 0.067 | J | 52 | 185 - 277 | NA |
| | | | | | | | | Cyclohexane | 0.270 | J | 140 | 245 - 1118 | 2270 |
| | | | | | | | | Methylcyclohexane | 1.100 | | 230 | 3036 - 4554 | NA |
| | | | | | | | | n-Hexane | 0.082 | J | 110 | 226 - 339 | 2270 |
| | | | | | | | | Tetrachloroethene | 0.094 | J | 5.1 ¹ | 259 - 389 | 45.4 |
| | | | | | | | | 2-Methylnapthalene | 0.049 | J | NA | 135 - 203 | NA |
| | | | | | | | | Bis(2-ethylhexyl) phthalate | 0.150 | J | 390 ¹ | 414 - 621 | 45.4 |
| Pyrene | 0.021 | J | 2,300 | 58 - 87 | 2270 | | | | | | | | |

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|---------------|---------------------------------|---|---|---------------------------|----------------------------|-----------------------------------|--------------|------------------------|-----------------------|------|-------------|---------------------------------|--------------------------|
| 2/3/2015 | Hy-Pro (Fuel Conditioning) Unit | Part failure | NAPL (JP-4) | 5-10 | 0 | 2/3/2015 (Drums) | | See note 3 | | | | | |
| | | | | | | 2/10/2015 Surrounding soil area 1 | 8260B | 1,2,4-Trimethylbenzene | 9.6 | DQ | 110 | 1325 - 2649 | NA |
| | | | | | | | | 1,3,5-Trimethylbenzene | 23 | DQ | | 3174 - 6348 | NA |
| | | | | | | | | Isopropylbenzene | 3.8 | JDQ | | 524 - 1049 | NA |
| | | | | | | | | Naphthalene | 8.1 | JDQ | | 1118 - 2236 | 45.4 |
| | | | | | | | | n-Butylbenzene | 2.8 | JDQ | | 386 - 773 | NA |
| | | | | | | | | N-Propylbenzene | 6.5 | JDQ | | 897 - 1794 | NA |
| | | | | | | | | p-Isopropyltoluene | 8.1 | DQ | | 1118 - 2236 | NA |
| | | | | | | | | sec-Butylbenzene | 11 | DQ | | 1518 - 3036 | NA |
| | | | | | | | | Xylenes, Total | 6.5 | Q | | 897 - 1794 | |
| | | | | | | 2/10/15 surround soil area 2 | 8260B | 1,2,4-Trimethylbenzene | 0.076 | J | 110 | 10 - 21 | NA |
| | | | | | | | | 1,3,5-Trimethylbenzene | 0.36 | | | 20 - 99 | NA |
| | | | | | | | | Isopropylbenzene | 0.05 | J | | 7 - 14 | NA |
| | | | | | | | | N-Propylbenzene | 0.12 | J | | 17 - 33 | NA |
| | | | | | | | | p-Isopropyltoluene | 0.14 | J | | 19 - 39 | NA |
| | | | | | | | | sec-Butylbenzene | 0.18 | J | | 25 - 50 | NA |
| | | | | | | | | Xylenes, Total | 0.14 | J | | 19 - 39 | 45.4 |
| 2/12/2015 | Boiler #2 | Insufficient volume | HCL Solution | 20-30 | 0 | NA | NA | --- | --- | --- | --- | --- | --- |
| 2/19/2015 | SVE System | Disconnected SVE condensate transfer line | Condensate | 7-14 | 0 | 2/24/2015 | 8260b, 8270c | See note 3 | | | | | |
| 3/9/2015 | Carbon vessel inlet line | Tee at inlet was cracked | process water | 5 | 5 | 3/9/2015 Surrounding soil | 8260b, 8270c | 1,2,4-Trimethylbenzene | 0.2 | J | | 28 | NA |
| | | | | | | | | 1,3,5-Trimethylbenzene | 0.15 | J | | 21 | NA |
| | | | | | | | | Methylcyclohexane | 0.16 | J | | 22 | NA |
| | | | | | | | | Naphthalene | 0.11 | J | | 15 | 45.4 |
| | | | | | | | | n-Butylbenzene | 0.07 | J | | 10 | NA |
| | | | | | | | | n-Hexane | 0.047 | J | | 6 | 2270 |
| | | | | | | | | p-Isopropyltoluene | 0.056 | J | | 8 | NA |
| | | | | | | | | sec-Butylbenzene | 0.073 | J | | 10 | NA |
| | | | | | | | | Tetrachloroethene | 0.056 | J | | 8 | 45.4 |
| | | | | | | 3/9/2015 Soil in drum | | 2-Methylnaphthalene | 14000 | DQ | | 1931919 | NA |
| | | | | | | | | Acenaphtene | 150 | JDMQ | | 20699 | 45.4 |
| | | | | | | | | Fluorene | 220 | JDQ | | 30359 | 2270 |
| | | | | | | | | Naphthalene | 5200 | DQ | | 717570 | 45.4 |
| 3/9/2015 | Boiler/DA Sump Blowdown Line | Cracked PVC line | Boiler blowdown water | 500 | 0 | NA | NA | --- | --- | --- | --- | --- | --- |
| 3/12/2015 | Boiler Sump | Blowdown sump pump failure | Water softener backwash & boiler blowdown water | 300-500 | 0 | NA | NA | --- | --- | --- | --- | --- | --- |
| 3/16/2015 | Boiler/DA Sump Blowdown Line | Cracked PVC line | Boiler blowdown water | 300 | 250 | NA | NA | --- | --- | --- | --- | --- | --- |
| 3/30/2015 | Carbon vessel inlet line tee | Cracked tee in the PVC line | Process water from inlet to liquid carbon vessels | 300 | 275 | 4/2/2015 | 8260B | 1,2,4-Trimethylbenzene | 0.13 | JQ | --- | 1076 | NA |
| | | | | | | | | 1,3,5-Trimethylbenzene | 0.093 | JQ | | 770 | NA |
| | | | | | | | | Cyclohexane | 1.6 | | | 13247 | 0.454 |
| | | | | | | | | Methylcyclohexane | 3.7 | | | 30635 | NA |
| | | | | | | | | Methylene Chloride | 0.1 | J | | 828 | NA |
| | | | | | | | | Naphthalene | 0.08 | JQ | | 662 | 45.4 |
| | | | | | | | | n-hexane | 0.18 | J | | 1490 | 2270 |
| | | | | | | | | p-Isopropyltoluene | 0.076 | JQ | | 629 | NA |

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|---------------|-----------------------------------|--|---------------------------------------|---------------------------|----------------------------|------------------|--------------|---|-----------------------|-----|-------------|---------------------------------|--------------------------|
| 4/21/2015 | Boiler/DA Sump Blowdown Line | Plugged pump and dislodged switch | Boiler blowdown water (non-impacted) | 400-500 | 200 | NA | NA | --- | --- | --- | --- | --- | --- |
| 6/1/2015 | Carbon Vessel C101B | Leak at the C101B carbon vessel manway | Process water | 75 | 35 | 6/2/2015 | 8260b, 8270c | Benzo[a]pyrene | 0.022 | J | | 46 | 0.454 |
| | | | | | | | | Bis(2-ethylhexyl) phthalate | 0.082 | J | | 170 | 45.4 |
| | | | | | | | | Pyrene | 0.032 | J | | 66 | 2270 |
| 7/7/2015 | Sample port at ST012 CZ07 | Sample port left open, extracted water spilled onto asphalt | Extracted treatment zone water | 100-200 | Allowed to evaporate | NA | NA | --- | --- | --- | --- | --- | --- |
| 8/28/2015 | Carbon vessel C101A manway gasket | Manway gasket was leaking | Process water | 5-10 | 0 | NA | NA | --- | --- | --- | --- | --- | --- |
| 9/21/2015 | Carbon vessel C101A manway gasket | Manway gasket was leaking | Process water | 500-600 | 500 | 9/21/2015 | 8260B, 8270C | All VOCs and SVOCs analyzed were below the detection limit. | | | --- | --- | --- |
| 11/19/2015 | Boiler/DA Sump Blowdown Line | PVC Line leaks at unions | Boiler blowdown water (non-impacted) | 300 | All freestanding liquid | NA | NA | --- | --- | --- | --- | --- | --- |
| 12/6/2015 | Boiler blow down sump | Sump transfer pump and high level alarm failed and water overflowed the sump. Backup pump was obstructed and had limited flow as well. | Boiler blowdown water (non-impacted) | 600 | All freestanding liquid | NA | NA | --- | --- | --- | --- | --- | --- |
| 12/19/2015 | Boiler blow down sump | Mineral obstruction in pump transfer line, pressure buildup caused hose to separate, water overflowed onto ground. | Boiler blowdown water (non-impacted) | 300 | All freestanding liquid | NA | NA | --- | --- | --- | --- | --- | --- |
| 12/21/2015 | Boiler blow down sump | Mineral obstruction in pump transfer line, pressure buildup caused hose clamp to separate, water overflowed onto ground. | Boiler blowdown water (non-impacted) | 300 | All freestanding liquid | NA | NA | --- | --- | --- | --- | --- | --- |
| 1/5/2016 | Wellfield near CZ09 | Water dripping from steam manifold with fuel odor. During steam injection shutdown, three valves became unseated an allowed condensed subsurface vapors to leak out. | Groundwater / condensed process vapor | 10 - 20 | 15 plus rain water | TBD ³ | 8260B, 8270C | --- | --- | --- | --- | --- | --- |

Notes:

¹ Lifetime cancer risk of 10⁻⁵

² Mass estimate based on volume of liquid spilled, estimated volume of impacted soil, and analytical results.Example calculation provided:

³ Soil sample to be taken at a later date

$\phi = porosity = 0.3$

$e_o = \text{initial voids ratio} = \left[\frac{\text{ft}^3 \text{ void space}}{\text{ft}^3 \text{ soil}} \right]$

$e_1 = \text{voids ratio after spill} = \left[\frac{\text{ft}^3 \text{ void space}}{\text{ft}^3 \text{ soil}} \right]$

$mc_o = \text{initia l moisture content} = 0.15$

$e_o = (\phi - [\phi * mc_o]) = 0.255$

$e_1 = (\phi - [\phi * mc_1]) = 0.015$

$M_{est} = \frac{V_s}{e_o - e_1} * \rho_b * C * \left[\frac{1 \text{ ft}^3}{7.48 \text{ gal}} \right] * \left[\frac{1 \text{ kg}}{2.2 \text{ lb}} \right]$

$M_{est} = \frac{20}{0.240} * 109 * 0.044 * 0.134 * 0.455$

LGAC - liquid phase granular activated carbon

mg - milligrams

mg/kg - milligrams per kilogram

PVC - polyvinyl chloride

SRL- Soil Remediation Level (Residential), Arizona Department of Environmental Quality, 30 March 2007

Data Qualifier Definitions:

D = The reported concentration is from a diluted sample.

J = The reported concentration is considered an estimated value due to discrepancies in meeting certain analyte-specific quality control criteria.

M = The reported concentration is estimated due to matrix effects.

Q = One or more of the quality control criteria failed for this result.